Green Soybeans

Prepared by Horst Bohner, Soybean Specialist - Stratford OMAF

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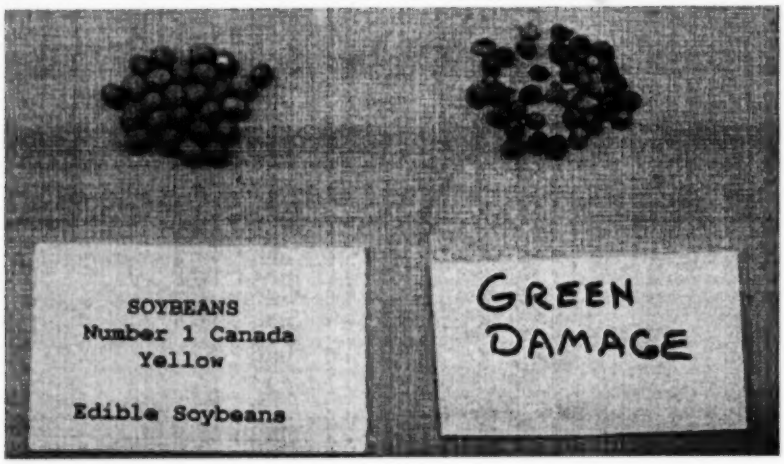
An extremely dry summer resulted in lower yields and introduced a new problem for many Ontario soybean growers. At harvest, some producers were shocked to discover that up to 70% of their harvested soybeans were green, even though seed moisture was only 12%. Worse, some elevators would not accept these soybeans or imposed large discounts. IP soybeans were also affected and some ended up going to the crusher since they could not meet quality standards. Various percentages of green beans could be found in fields throughout most of southwestern Ontario. The majority of fields had less than 15% green, but some fields in Elgin, Lambton, Chatham-Kent, Essex, and Middlesex had much larger percentages. The problem was most severe in those regions that were extremely dry during July and August.

These green beans were not the large unripe green beans that can be found most years in Ontario, when parts of the field that are not ripe are harvested along with ripe beans. Instead, a large percentage of *dry* green beans were harvested along with the mature yellow beans. Although this was a new dilemma for the Ontario soybean industry, some of the dryer US soybean growing areas like Kansas have experienced this problem before. Under normal conditions, as the plant matures, an enzyme called chlorophyllase degrades the chlorophyll in the bean to result in a normal soybean colour. Extremely dry hot weather during the latter stages of seed maturation this summer influenced this activity. It's believed that bean drying and maturation occurred so quickly that the enzyme activity stopped before all of the chlorophyll could be metabolized.

There are two types of dry green soybeans. The first category involves a green tinge on the outside of the bean, while the inside remains yellow. These beans are generally classified by the Grain Commission as 'not of good natural colour'. They are designated as Grade 2 and are not discounted. In the second category however, a green discolouration can be found right through the entire soybean. The Grain Commission grades these green beans as 'damaged kernels'. Depending on the percentage of green beans and other damage present in the sample, these beans are downgraded. The reason green soybeans are discounted by the crusher is that the chlorophyll has a direct effect on oil quality and content. The extra bleaching required during processing to remove the chlorophyll increases processing costs and reduces oil yield.



Will this green colour degrade over time if the beans are left in the field or put into storage? Since the beans are dry the "activity" inside the bean is minimal. The enzyme that normally breaks down the chlorophyll cannot function at such low moistures therefore the green colour will not disappear over time. There may be some improvement to the green tinge on the outside of the bean over time but the green discolouration inside the bean will remain.

Some food-grade soybeans are also being harvested with a large number of green beans. Although an electronic eye can pick out a certain percentage of these undesirable beans there are limits to the number of green beans that can be removed. Since appearance and processing quality standards for food-grade beans are high some intended IP soybeans will not make food grade due to these green beans.

The green seed issue is not uncommon to canola growers in Western Canada. Researchers have been working on the problem in canola for a number of years. Strategies involving plant breeding as well as transgenic approaches have been attempted to minimize the impact of green seeds on oilseed canola.

Lab analysis of various green bean samples from across the province showed no significant protein or fat differences in these green beans. In fact except for the extra chlorophyll no significant differences could be found in any of the 19 components tested. It's also believed that germination and vigour and not affected by this green colour.

Lab Results from Various Green Soybeans

Green Soybeans	Variety													
	A			B			C			D			E	F
	Subsample*													
	I	II	III	I	II	III	I	II	III	I	II	III		
% Green	100%	8%	0%	100%	15%	0%	100%	25%	0%	100%	60%	0%	20%**	30%**
% Protein	36.04	35.61	33.87	36.63	35.68	35.62	36.21	36.14	35.21	36.79	37.62	36.12	37.46	36.29
% Moisture	9.76	9.98	9.75	9.92	9.55	9.8	9.86	9.72	9.86	9.21	9.27	9.34	7.99	10.34
% Calcium	0.19	0.18	0.19	0.19	0.2	0.19	0.18	0.19	0.2	0.21	0.21	0.23	0.18	0.21
% Phosphorus	0.4	0.42	0.44	0.35	0.37	0.36	0.3	0.32	0.33	0.42	0.42	0.43	0.49	0.52
% Potassium	1.58	1.55	1.65	1.47	1.56	1.56	1.46	1.49	1.5	1.57	1.6	1.61	1.73	1.79
% Magnesium	0.18	0.18	0.2	0.2	0.21	0.2	0.17	0.17	0.17	0.18	0.19	0.18	0.22	0.22
% Sodium	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01
% Ash	5.92	5.7	6.03	5.83	5.72	6.21	5.91	6.23	6.19	5.93	5.84	5.83	6.38	6.53
% Acid Deter Fibre	9.9	9.4	9.9	9.3	9.4	9.4	7.6	8.7	8.6	10.6	8.4	12.1	10.9	9.3
% Neutral Deter Fibre	11	11	10.9	10.5	11.5	11.2	10.2	11.6	11.4	11.4	11.4	14	11.2	11.2
% Fat	19.3	20.4	19.8	18.8	18.6	19.3	21.9	21.2	22.4	19.2	19.5	18.5	20.34	17.42
% TDN(estim)	86.86	87.32	86.86	87.41	87.32	87.32	88.96	87.95	88.04	86.22	88.23	84.86	85.95	87.41
Net Energy(lac)MCAL/kg	1.74	1.75	1.74	1.75	1.75	1.75	1.78	1.76	1.76	1.73	1.77	1.7	1.72	1.75

Net Energy(gain)MCAL/kg	166%	167%	166%	1.67	1.67	1.67	1.72	1.69	1.69	1.64	1.7	1.6	1.63	1.67
Net Energy(maint)MCAL/kg	2.37	2.39	2.37	2.39	2.39	2.39	2.44	2.41	2.41	2.35	2.42	2.3	2.34	2.39
% Soluble Protein	23.68	24.39	23.66	23.83	24.81	24.11	26.51	24.54	24.91	23.91	25.58	21.41	26.07	25.5
SP % of CP	65.7	68.49	69.86	65.06	69.53	67.69	73.21	67.9	70.75	64.99	68	59.27	69.59	70.27
UIP % of CP(bypass)	25.25	27.52	25.1	25.39	25.22	27.51	19.88	25.73	23	26.09	23.66	35.99	27.76	26.73
DIP % of CP	74.75	72.48	74.9	74.61	74.78	72.49	80.12	74.27	77	73.91	76.34	64.01	72.24	73.27

Column I contains values from only green soybeans of that variety
Column II contains values from the beans as they come from the field
Column III contains values from only yellow soybeans of that variety
**Variety E and F were not segregated into 100% green, mixed, and 100% yellow beans
These values represent the sample as it came from the field.

There is little producers can do to avoid having green beans in the future since no one can control the weather. Variety and planting date differences do exist but these differences are not consistent across regions. A good crop rotation along with choosing the best varieties suited for your area is the best defense. Remember that the likelihood of having similar extremely dry conditions again next year is small.

For more information contact Horst Bohner at horst.bohner@omaf.gov.on.ca

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